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High School Students Opinions of Lumosity to Assist Assignment Submission

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Abstract: Interest in online learning, games for learning, immediate feedback and the brain science of neuroplasticity are research topics that have created interest within the field of education. The website Lumosity has merged these varied research topics to create a learning website based on neuroplasticity techniques, while implementing immediate feedback, accessibility of being online and the fun of games. Students have generally viewed homework with disdain, while teachers and administrators have to struggle with students to convince them of homework's importance. Homework submission has been linked to educational attainment and success. While Lumosity is not specifically for homework submission, different games can be played to address components that are related to homework submission, specifically concentration, problem solving and decision making. Can the use of Lumosity by High School Seniors improve homework submission and what are the students perceptions of Lumosity? Field notes, observation, a small group interview and four surveys throughout research were used to collect data. Results showed that students had a positive opinion towards Lumosity. There were students in both the control group and experimental group that would spend three hours a week on Lumosity in their free time. The students opinions regarding Lumosity improving homework submission was the lowest. When examining homework submission in the classroom, there was an increase in the middle of the research, but this increase coincided with homework submission that was essential for graduation. Students did show a positive opinion of the main components of Lumosity: neuroplasticity, games, immediate feedback, online accessibility and games. According to student opinions in surveys and interviews, Lumosity led to an improvement in concentration, intellectual stimulation and fun.

Introduction

Making High School students think about improving their assignment completion and submission can be a daunting task. While homework usually has a negative connotation for students,

homework submission and completion is connected to academic achievement (Madaus, 2003). Schools have thought of myriad ways to remind and motivate students to turn in their homework from planners, involving parents and school websites. With all of the changes in technology and different motivational techniques, students still struggle with turning in their assignments on time and completed. Lumosity integrates the use of instant feedback because it is “helping students in their learning” (Peat, 2002). Neuroplasticity is the term that explains how the brain changes when exposed to different types of learning stimulus (Schwartz, 2002). Gaming could “provide training and learning in groups. . . .” (de Freitas, 2007). Gaming can improve learning if it utilizes tried and tested methods (de Freitas, 2007). The online learning site Lumosity merges online learning with immediate feedback, neuroplasticity and gaming. One of the challenges of educators is to find tools that students might use in their free time to improve their education. Working as a teacher for the past ten years, I have attended many faculty meetings about the importance of formative assessment done through homework and classwork that allows students to be successful in summative assessments and standardized tests. One of the obstacles encountered is how to get students to improve their homework completion and submission in a way that is accessible, fun, entertaining and stimulating. The purpose of this action research study is to evaluate the perceptions of High School Seniors after the introduction of the website Lumosity into their Senior Project classes for the purpose of improving their assignment completion and submission rate.

Project Description

The subjects in this study consisted of a class of fifty three High School Seniors at a private school, they spent fifteen minutes on the website Lumosity, three times during a six day cycle. The research took place over the course of six weeks.

While Lumosity is not specifically designed for homework submission, there are categories within Lumosity that are conducive to assignment submission: memory, attention, speed, flexibility and problem solving. The students were observed while completing Lumosity. The teacher kept track of the homework assignments over the course of the month and tracked homework submission. The students completed a survey about their opinions about the program on a Google doc. The survey included both multiple choice and open answers regarding their opinions of Lumosity.

Research Methods

Gathering students’ perceptions of Lumosity was recorded using multiple methods (Patton, 2002). Surveys, field notes and observations were completed throughout the research period of six weeks. Surveys were the primary method of data collection and there were four data collection periods, done over the course of six weeks. A survey was given pre Lumosity, one cycle into using Lumosity, three cycles of using Lumosity and the last survey was completed after four cycles of using Lumosity. After each data collection results were analyzed and recorded using Google Forms. A small group interview was conducted at the end of the study. To track the progress of homework submission and completion, homework grades were averaged for the experimental group for each of the four data collection periods.

Homework Submission and Completion

Students homework submission is on a three point scale: a two indicates that homework was turned in on time and completed, a one indicates homework that was turned in late or not fully completed and a zero indicates that homework was not turned in. An average homework grade will be assigned for the group using Lumosity at each of these data collection points.

Field Notes and Observations

Gathering students' perceptions and observations were taken. The researcher observed students completing Lumosity for the duration of the five weeks, and verbal comments were recorded.

Survey Open Answer Questions

Open answer questions were collected to identify positive, neutral and negative opinions of Lumosity that could not be collected using Likert scale questions.

Survey

The four data collection periods had questions that were expressed by five options: strongly agree, agree, neutral, disagree and strongly disagree. The control group and experimental group completed the pre-Lumosity and cycle four survey. The experimental group completed all of the surveys.

Small Group Interview

A small group interview was completed at the end of the study to get more open feedback and to gather opinions not addressed in the survey. A group of four students took part in the interview. There were three categories of questioning: use and like ability, improvement and application of Lumosity.

Lumosity use and opinion questions:

- 1) How many hours per week did you use Lumosity? What was your final BPI?
- 2) What did you like most about Lumosity?
- 3) What did you like least about Lumosity?
- 4) Do you think that using Lumosity impacts homework submission and completion? Why or why not?

Possible improvement and homework questions:

- 1) What area of Lumosity needs improvement?
- 2) What is the most important component of turning in homework?
- 3) Can Lumosity be used to improved and address homework submission? If yes, how? If not, why not?
- 4) How can Lumosity be used to improved to address homework submission?
- 5) Do you think a learning program can be created so that you turn in homework?

Possible application and free time use questions:

- 1) Would you use Lumosity if it wasn't part of school work? Why or why not?

- 2) What games in Lumosity could help in homework submission? What area of homework submission would it help?
- 3) Using Lumosity would help users _____. Why?

Background

Psychologists have tried to deal with the homework problem with some success by using behavioral psychology and utilizing a “mystery motivator” if students turned in and completed their assignments. Kesler (2011) noted the benefits of using an online web based program because of immediate feedback, systematization of delivery, entertaining programs and the convenience of accessing the program via a smart phone or computer.

The history of Neuroplasticity is documented by Schwartz (2003). The findings showed that the brain was able to rezone itself to adjust for the new stimulus. Merzenich took the findings about brain reorganization and took to the task of mapping of the brain or connecting which parts of the brain are responsible for the stimulation of various body parts.

After more research it was found that the reason for this was neuroplasticity, the brain can change structurally when nudged by therapy and mental effort. In the research to create Lumosity, it cites studies of stroke victims, benefits of web based learning and the latest research in web based learning. Lumosity applies neuroplasticity and merges it with research of web based learning techniques and principles. Feinberg (2000) examined load theory to web based instruction to examine the different types of loads to assist in web based learning. They then created a web site that properly loads the brain with both visuals and sounds with the proper stimulation. Barnes (2009) also studied the use of computer based cognitive training for patients that had mild cognitive impairment. The study found that seventy seven percent of the participants completed the training and were able to improve on the area of the brain that the computer stimulated. While the study is not statistically significant it does show that there are benefits to web based learning programs that integrate load theory. The application of these methods allow for new stimulation of the brain that can be channeled to assist in learning.

Findings

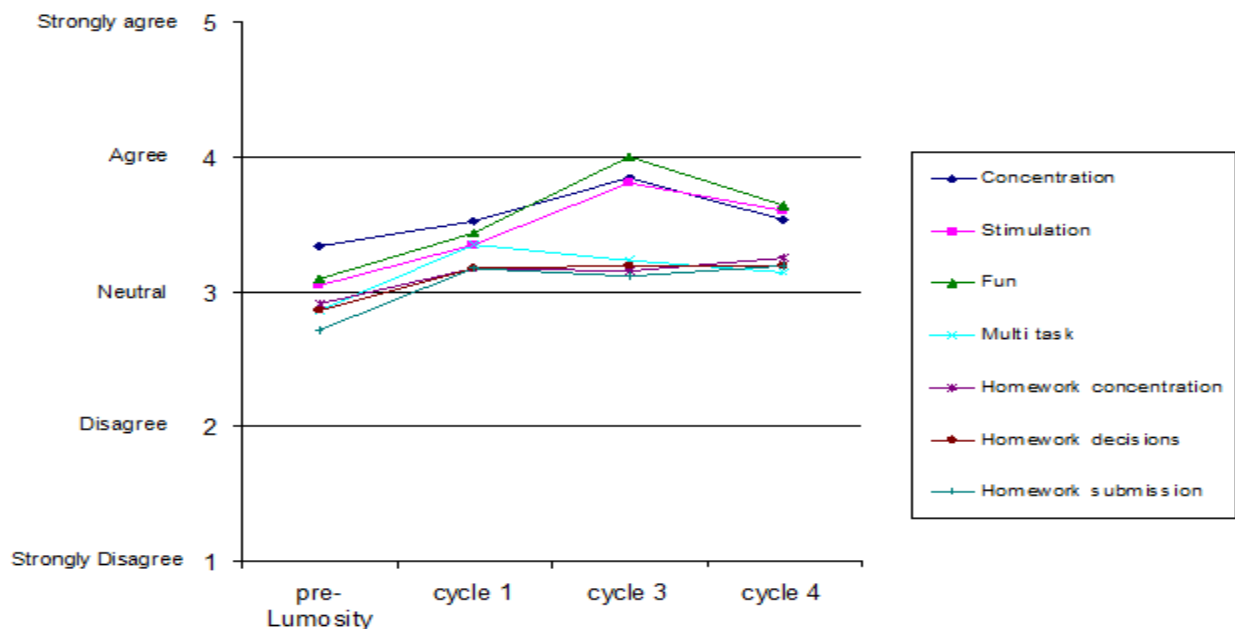
The implementation of Lumosity started on January 22, 2013 at the beginning of the second semester for the 2012-2013 school year and ended on March 6, 2013. The Lumosity statement was read and displayed to begin research. Students were given user names and the password for the site. A website was created so students could get directions on how to get to Lumosity, how to download the driver if using smart phones and start the Lumosity pre-test. For the students that had difficulty logging in, they were told to have neutral responses for the survey questions involving opinions of Lumosity. The students that participated were generally excited about playing games for class, but there were students that voiced displeasure about using class time for the study.

Student opinions of Lumosity to improve education and homework submission

There were seven survey questions regarding opinions of Lumosity and areas that it improves. The seven categories were: concentration, stimulation, fun, multi tasking for homework, concentration for homework, better decisions to do homework, and lastly improved homework

submission and completion. The students were given the options of strongly disagree, disagree, neutral, agree and strongly agree. The students survey showed that the three areas that Lumosity improves are concentration, fun and intellectual stimulation with a steady incline throughout cycles one through three with a slight decrease in cycle four. The students survey also showed that they did not think that Lumosity improved any aspect of homework. The four homework areas were multitasking to improve homework submission, improving the decision to do homework and finally in homework submission. These four areas averaged slightly above neutral with only a slight increase throughout the data collection period, but always remaining only slightly above neutral. The summary of results for student opinions of areas that Lumosity improves for education and homework submission is shown in Figure 1.

Figure 1. Student opinions of areas that Lumosity improves for education and homework submission.

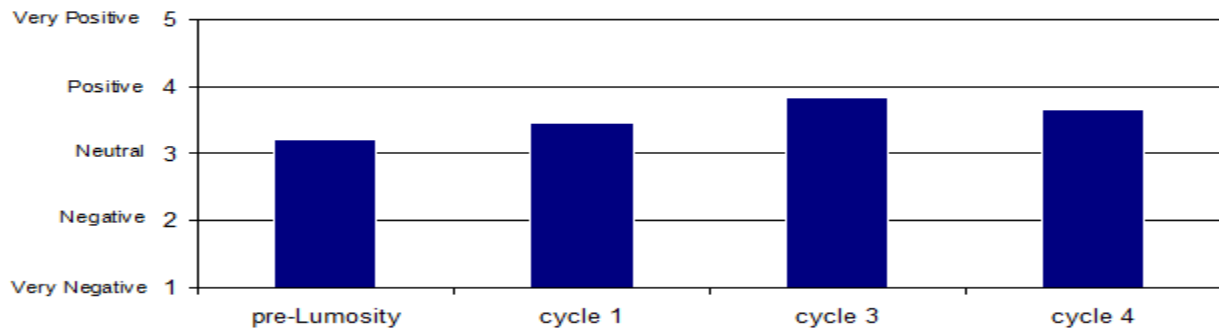


The interviews showed positive responses for Lumosity and homework submission. Three of the four interview responses stated Lumosity positively impacts homework submission. Three of the four interview responses stated that Lumosity improved homework because it improves concentration. According to three interview responses, the Lumosity game that could improve homework submission was the Chalkboard game since it would improve a person's ability to do math. Only one of the interview responses showed that a computer-based learning program could be created so that it makes students turn in homework. The reason why a computer program could not be used for homework submission was distraction and choice "... teenagers are only going to do homework if they're being told to do it, and if they're on the computer there is no one making them do the homework." So while there was a positive view of Lumosity expressed in the interview, the students still had their doubts about a computer program helping students make the decision to do their homework. The last question asked what Lumosity helps users with. The interview responses reconfirmed the survey results by stating concentration and memory.

General students opinions of Lumosity

For the question, “My general opinion of Lumosity is ____.” The trend for the duration of the study was that the opinions towards Lumosity was positive with the peak at cycle three and dropping at cycle four. The general opinion of Lumosity is shown in Figure 2.

Figure 2. General Lumosity opinion.



In the post Lumosity interview the students answers reflected a positive opinion towards Lumosity, all four interviewers mentioned games as what they liked most. The question that asked what they liked least were the math games, the increasing difficulty of games and the lack of selection of games for mobile devices. The interview responses about Lumosity are shown in Figure 3.

Figure 3. Interview responses regarding likes and dislikes of Lumosity.

Question	Student Responses
What did you like most about Lumosity?	<p>“I liked that there were many games that I could chose from.”</p> <p>“What I like most about Lumosity is that the games are made in an enjoyable way that makes it somewhat addictive.”</p> <p>“I liked how the games make you use your brain.”</p> <p>“I liked how the games are fun but still exercised the brain and you forget that you’re using your brain.”</p>
What did you like least about Lumosity?	<p>“I least liked that there were not as many games available on the APP than on the online version.”</p> <p>“What I like least is the math problem games because I’m not that good in addition and subtraction.”</p> <p>“That the games got harder and harder.”</p> <p>“Sometimes the games didn’t work or were slow.”</p>
What area of Lumosity needs improvement?	<p>“Some of the links didn’t work when trying to play some programs.”</p> <p>“At school the games didn’t work unless you refresh it a hundred million times.”</p> <p>“Making the games more fun instead of getting harder.”</p> <p>“The pre and post test didn’t work for me.”</p>

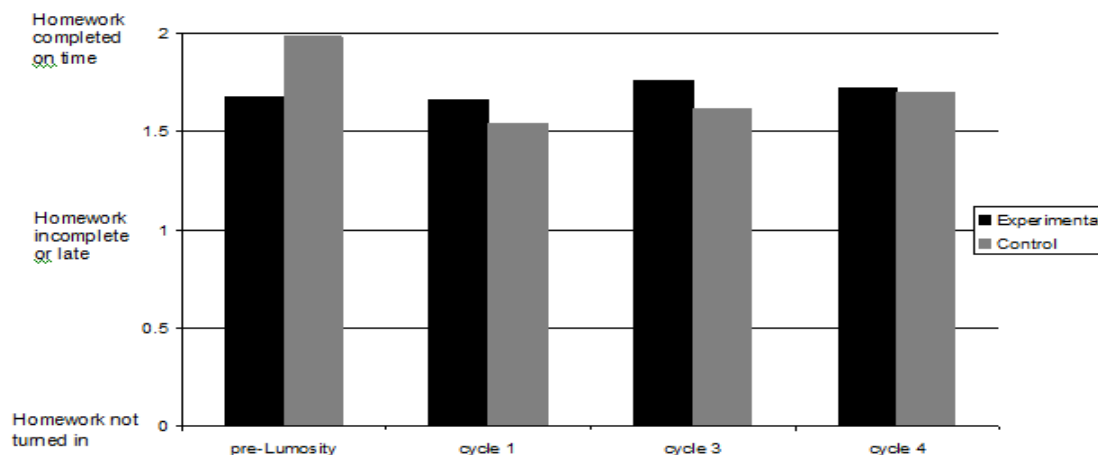
Homework submission and completion on Lumosity

In examining the survey results, for three of the four periods for data collection the experimental

group had higher homework completion and submission rates than the control group. The only exception is the pre-Lumosity survey which was completed before students were on Lumosity. The experimental group results for the pre-Lumosity data collection time was 1.67, the cycle one average was 1.66, the cycle three average was 1.76 and the cycle 4 average was 1.72. For the experimental group the research average of 1.70 for the four data collection periods. The control group results for the pre-Lumosity data collection time was 1.98, the cycle one average was 1.54, the cycle three average was 1.61 and the cycle four average was 1.7. For the control group the research average was also 1.7075 for the four data collection periods. The research average was 1.70 for both groups during the data collection periods.

However, the average of the control group and the experimental group for the time that the research participants were on Lumosity the averages change. The control group averaged 1.61 for their time on Lumosity. The experimental group averaged 1.71 for their time on Lumosity. The positive influence of Lumosity can also be seen if the pre-Lumosity homework submission is compared with the homework submission average. The control group maximum differential was 1.98 pre Lumosity to a 1.61 average for the four cycles on Lumosity for a decrease of 0.37. The experimental group maximum differential was 1.67 to a 1.7 average for the four cycles for an increase of .03. While the difference is marginal the positive impact on Lumosity can be seen in the maximum difference between averages. The biggest differential for the control group was from 1.98 Pre-Lumosity to 1.54 for cycle one, with a difference of -.044. The biggest differential for the experimental group was from 1.66 cycle one to 1.76 for cycle three with a difference of +0.10. So in examining the data points it appears that Lumosity did have a marginal positive impact on the students homework and completion when looking at averages. The difference in Lumosity can be positively seen in the big drop in homework submission and completion for the control group, while the experimental group saw a slight increase for the duration of research. The survey results for homework completion and submission are shown in Figure 4.

Figure 4. Survey results for homework completion and submission.



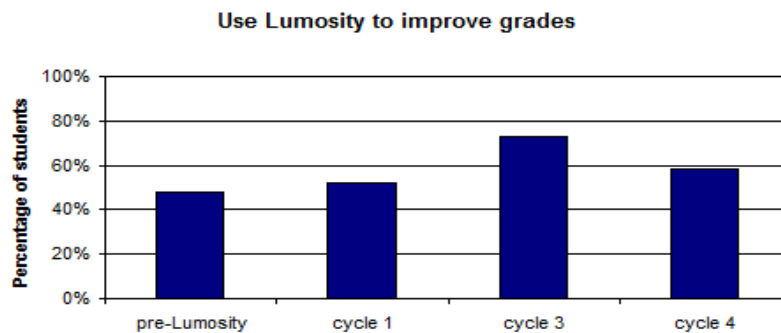
The interview responses were also split regarding whether Lumosity impacts homework submission and completion. The interview responses show a split regarding Lumosity positive impact on homework submission and had differing opinions about what is the home important component of turning in homework. The interview results for student opinions regarding homework submission are shown in Figure 5.

Figure 5. The interview results for student opinions regarding homework submission.

Question	Student Responses
What is the most important component of turning in homework?	<p>“The most important component of turning in homework is that it helps one to practice what they learned.”</p> <p>“The most important component is to see what you have learned and to help prepare you for future tests.”</p> <p>“So it lets you practice and develop skills.”</p> <p>“I’m concerned about my grades and it helps you prepare for tests and quizzes.”</p>
Do you think that using Lumosity impacts homework submission and completion? Why or why not?	<p>“I think that it helps with submission of homework because it helps one to concentrate.”</p> <p>“In my opinion, because its games, it just makes me want to play them. Not so much change my habits of turning in work. I get distracted very easily.”</p> <p>“It could because it helps train your brain it teaches you to be diligent and not quit until it was finished.”</p> <p>“I don’t think so because they’re different than homework. It’ll improve if you are already doing homework, but if you’re not doing homework then I don’t think it’ll make a difference.”</p>

Students Desire to use Lumosity

The positive view of Lumosity is seen more clearly when the students were asked if they would use Lumosity in their freetime to improve their grades. The percentage of students using Lumosity increased from pre-Lumosity from 48% through cycle three to 73%. There was a fifteen percent drop from cycle three to cycle four dropping to 58%. So a majority of students would use Lumosity, an online, learning based website that gives immediate feedback, using games that utilize neuroplasticity techniques. The survey results for using Lumosity during free time to improve grades are shown in Figure 6.

Figure 6. Percentage of students that would use Lumosity in their free time to improve grades.

The survey view of Lumosity was affirmed in the interview. Both survey and interview affirms that students enjoyed Lumosity enough to use it in their free time to improve their learning. While they were doing learning exercises the use of games made students want to use Lumosity. Interview results for using Lumosity during free time to improve grades are shown in Figure 7.

Figure 7. Interview results for using Lumosity during free time to improve grades.

Question	Student Responses
On average, how many hours per week did you use Lumosity? What was your max Brain Performance Index number on Lumosity?	<p>"I spent like 3-4 hours on Lumosity per week. My max BPI was 1091."</p> <p>"I spent about 2-3 hours on Lumosity. My max BPI was 947."</p> <p>"I spent 2-3 hours per week on Lumosity. My max BPI was 700."</p> <p>"I spent 3 hours per week. My max BPI was 900-1000."</p>

Field Notes and Observation

One of the problems encountered throughout research was the inability of the students to log on and use Lumosity. Students had trouble logging in to their accounts both on their laptops and on their mobile devices. When they were able to log on some students had difficulty playing the games. This resulted in frustration on the part of the students who had to log in numerous times or had to wait for the games to work. These technical difficulties were in spite of the researcher following the directions given in the Lumosity packet.

The inconsistency of the program also showed itself in the post test. Only twenty seven students out of both the control group and experimental group were able to take the Post Lumosity Test provided by the company. For the students that could take the test, there was a competition about the test scores amongst the students of who could score the most points. This competitive environment contributed to the positive feedback for Lumosity.

Discussion

The research would be improved if research were to track the homework of the students across subject areas. The homework tallying process could also be modified. The school operates on a three point scale for homework submission not taking into consideration the points or importance of the homework assignment. Mandatory assignments were focused on and the smaller assignments were ignored and not completed.

Discussion for the future is to have the research time be extended to the recommended forty to fifty hours of Lumosity. According to the Lumosity representative, it is after this time that results are generally seen. Also to have all of the accounts be operational for the duration of research. The accounts, the pre test and post test did not work for all of the participants. It would be interesting to see the overall results of Lumosity if all of the participants were able to use Lumosity without technical problems. In regards to the program not working, it also prevented the researcher from making sure all of the students were playing the games that are most conducive to components of homework. The researcher was checking students computers to make sure they were logging in with the correct user name and password.

Conclusion

Web based sites like Luminosity represent a melding of technology and brain research on neuroplasticity. The implementation of Lumosity for improving homework submission and completion is a possibility. While the homework submission results did show a positive influence on homework submission the improvement was marginal and requires more research. The study does show that students did look favorably on Lumosity elements as a whole: neuroplasticity, immediate feedback and learning games. In the surveys and interviews the students opinions showed that Lumosity improves stimulation, concentration and fun. The mention of games was central to the positive opinion of Lumosity. Educational neuroplasticity games with immediate feedback in the form of correctness, speed and an increase or decrease of brain performance index based on performance was a topic of conversation while on Lumosity. Since students stated that they would use Lumosity in their free time, Lumosity could be implemented easily into an educational setting which students would participate in. As schools strive for new alternatives to improve homework submission, grades and graduation rates, the implementation of Lumosity seems to be a plausible and painless addition to educational settings.

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